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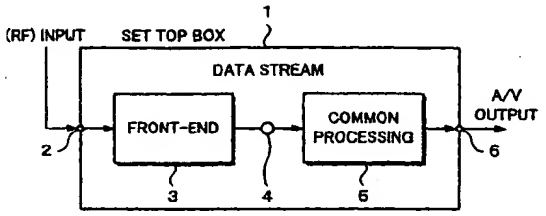
(54) RECEIVER AND RECEIVING METHOD

(57) STB 1 has a built-in common processor 5 for performing signal processing common to different kinds of communication media. An input to the common processor 5 can be connected to an output terminal of a front-end portion 3 removably held in a hold space. The front-end portion 3 performs signal processing exclusive to each communication medium. A data stream is output from the front-end portion 3 to the common processor 5 and processed there in a predetermined manner, and an A/V signal output. By preparing one or more front-end portions 3 exclusive to respective communication media, and selectively setting appropriate one in the hold space of STB 1, a desired communication medium can be received.

Fig. 1



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according to the invention.

Figs. 2A and 2B are schematic diagrams roughly sketching examples of outer appearance of a front-end portion.

Figs. 3A and 3B are schematic diagrams showing different embodiments of the receiver according to the invention.

Fig.4 is a fragmentary, perspective view showing an exemplary mode of connection in the receiver according to the invention.

Figs. 5A through 5C are diagrams showing different modes of connection in the receiver according to the invention.

Figs. 6A and 6B are diagrams showing further modes of connection in the receiver according to the invention.

Fig. 7 is a block diagram showing an exemplary construction of STB including the front-end portion.

Best Modes for Carrying Out the Invention

[0013] Explained below is an embodiment of the invention. A receiver according to the invention divides its signal processing into a part permitting common transaction for all of a plurality of communication media and a part variable among these communication media. Then, by permitting the portion variable among different communication media to be exchanged, the receiver becomes adaptive to different kinds of communication media with a single cavity.

[0014] Fig. 1 shows a concept of construction of the receiver according to the invention. The receiver is in form of a set top box (STB) 1, and an input signal is supplied to STB 1. The input signal is an RF signal when the communication medium is a satellite broadcasting, television broadcasting using a ground wave, or CATV. In case that the communication medium is CATV connected by optical cables, the input signal is an optical modulation signal. If the communication medium is the Internet, the input signal is an analog-modulated digital signal transmitted through a public telephone line, for example.

[0015] The input signal is supplied to a front-end portion 3 via an input terminal 2. the input signal is processed in a predetermined manner at the front-end portion 3, then converted to a signal form that can be processed in a common processor 5, and output therefrom. The output from the front-end portion 3 is reformed into a data stream, such as MPEG2 (moving picture experts group phase 2) transport stream, and supplied to the common processor 5.

[0016] In the embodiment shown here, the front-end portion 3 is configured to be removably set in a hold space in STB 1, at least with an output terminal 4 as a connector. An input terminal 2 of the front-end portion 3 can be connected to an input terminal of STB 1. Alternatively, it is exposed outside a cabinet of STB 1 so that a supply line of input signal is directly connected thereto. The front-end portion 3 is exclusive prepared for each one of communication media different in signal form. Therefore, by selecting appropriate one of front-end portions 3 for a particular communication medium to be received, a single STB 1 can copes with different kinds of communication media.

[0017] The common processor 5 processes a supplied signal, and outputs it as an A/V (audio/video) signal. Since the front-end portion 3 already finishes its own signal processing, the common processor 5 can be used for all of signals from different kinds of communication media using different signal forms. Output of the common processor 5 is connected to an exterior device, such as display device or VTR (video tape recorder, via a terminal 6.

[0018] Figs. 2A and 2B roughly illustrate outer appearances of the front-end portion 3. Fig. 2A shows an example of the front-end portion 3 adaptive to satellite broadcasting, CATV, digital television broadcastings, and so forth. The front-end portion 3 has the form of a cartridge, for example, which has a connector 21 including a plurality of pins extending from its end surface 20 as the terminal 4. From the surface opposite from the end surface 20, a connector 22 such as F-type connector or IEC connector, for example, extends to behave as the terminal 2. In the example of the front-end portion 3 shown in Fig. 2B, which is configured to allow connection to a telephone, a connector 22 is prepared as a modular jack. A connector for RS-232C may be provided as well. Not limited to the illustrated example, the connector 21 and the connector 22 may be provided on the same end surface 20.

[0019] Figs. 3A and 3B show different types of the receiver according to the embodiment. STB 1 has a slot for inserting the front-end 3. Fig. 3A illustrates an example having a single slot 10 for STB 1. On the other hand, Fig. 3B illustrates an example having a plurality of (three, for example) slots 11a, 11b and 11c for STB 1.

[0020] Preferably, the slot 10, or the slots 11a, 11b and 11c, each has formed therein a guide like a groove, for example, for guiding insertion of the front-end portion 3. And an eject mechanism is preferably provided to help removal of the inserted front-end portion 3.

[0021] In each slot 10, 11a, 11b and 11b, an STB-side connector is provided for connection to the connector 21 of the front-end portion 3. And the connector 22 appears outside. A connector fitting with the connector 22 may be provided on the part of STB 1 as well.

[0022] A plurality of front-end portions 3 each exclusive for each of communication media are prepared, such as front-end portion 3a for satellite broadcastings, front-end portion 3b for CATV, and front-end portion 3c for telephone, i.e., the Internet. In the example shown in Fig. 3A, any one of the front-end portions 3a, 3b and 3c is selectively inserted into the slot 10, defending on the communication medium to be received.

[0023] Also in the example of Fig. 3B having some (three, for example) slots 11a, 11b and 11c for STB 1, a

put from the terminal 6.

[0033] Selection by the switch circuit 40 is manually performed by the user, using a changeover switch (not shown) provided on the front face of STB 1, for example. STB 1 is connected to a television receiver, for example, connected to the output terminal 6 by a predetermined method so that control signal be exchanged between them. Thus, by changing the mode of the television receiver, i.e., changing the channel, a corresponding communication media can be selected in STB 1. In this manner, by configuring STB 1 to receive a predetermined control signal from the television receiver, it is possible to design the switch circuit 40 to link with an AV selector for changing a plurality of input sources.

[0034] In Fig. 6B, the slots 11a, 11b and 11c are provided on the back side. Similarly to the example shown in Fig. 5C, the connecter 21 and the connector 22 are positioned at opposite sides in each of the front-end portions 3d', 3e' and 3f'. To the connector 22 exposed to the back side of each front-end portion 3d', 3e' or 3f', a connection line of a communication medium corresponding to the front-end portion 3d', 3e' or 3f' is connected directly.

[0035] Fig. 7 schematically shows an arrangement of STB 1 containing the front-end portion 3. Explanation is made here as the front-end portion 3 being for CATV. In CATV, images and voices are compressed and encoded by MPEG2, then digitally modulated by QAM (quadrature amplitude modulation), and transmitted as a RF signal. Connected to the terminal 2 is a transmission line of CATV, and an input RF signal is frequency-converted into an IF signal with an intermediate frequency by a tuner 100.

[0036] The IF signal is supplied to a digital demodulator 103 made up of an A/D converter circuit 101 and a demodulator circuit 102. In this example using the front-end portion 3 for CATV, the digital demodulator 103 demodulates a QAM modulation signal. The signal demodulated into digital data by the digital demodulator 103 is supplied to a FEC (forward error correction) circuit 104, and an error correction code added on the modulation side is decoded there. The decoded and error-corrected data is supplied to the common processor via the terminal 4.

[0037] The front-end portion 3 has a construction corresponding to a communication medium for the front-end portion 3 to deal with. For example, the digital demodulator 103 may takes various forms not only of QAM mentioned above but also of 8-value VSB (vestigial sideband) modulation system, OFDM (orthogonal frequency division multiplex) modulation system, 8-phase PSK (phase shift keying) system, QPSK (quadrature phase shift keying) system, depending on the communication media. Similarly, the tuner 100 and FEC circuit 104 may take various arrangements. As a result, the front-end portion 3 can be made adaptive to various systems of communication media.

[0038] Data output from the front-end portion 3 may be a typical data stream, such as MPEG2 transport stream.

[0039] Therefore, usable as the later-stage circuit is one common to the front-end portion 3. That is, even when the front-end portion 3 is replaced or switched, the later-stage circuit (common processor 5) need not be changed.

[0040] Data output from the front-end portion 3 is supplied to the common processor 5. The signal supplied to the common processor 5 is separated into packets by a demultiplexer (DEMUX) 110, and the packets are divided to groups different in type of data, namely, group of video data and group of audio data, for example. If the signal is received in an encoded form, then the code is decoded by the decoder circuit 111, and its decoding is released. For example, if the signal is received in a scrambled form, the decoder circuit 111 descrambles the signal. The data is then supplied to an MPEG decoder 112. The MPEG decoder 112 includes an MPEG video decoder and an MPEG audio decoder, and the MPEG video data and MPEG audio data separated by DEMUX 110 are decoded individually.

[0041] The digital audio data decoded by the MPEG decoder 112 is converted into an analog audio signal by a D/A converter circuit 114, and output from the terminal 6'. The digital video data decoded by the decoder 112 is supplied to a video encoder 113. The video encoder 113 converts the input digital video data into a composite analog video signal of the NTSC 525 lines/59.95 Hz system, for example. Output from the video encoder 113 is released from the terminal 6.

[0042] The mode of output of the video signal may be other than the NTSC system, namely, video signal of the PAL system or SECAM system, or alternatively, analog or digital component signal (Y, R-Y, B-Y signal, or RGB signal), as well.

[0043] The video encoder 113 is not limited to the example shown here, and may be configured to be adaptive to the 1125 lines/60 Hz high vision system. Additionally, it may be designed to treat the PAL system and the SECAM system distributed mainly in western Europe. Furthermore, the video encoder 113 may have functions of these different system in combination to use any desired one by switching them.

[0044] The common processor 5 more preferably includes a central processor 115 including CPU, RAM, ROM, and so forth, for example, in addition to the above explained construction. Then, it will be able to perform various kinds of processing more flexibly. For example, the central processor 115 may control respective portions of the common processor 5 according to a predetermined program stored in ROM. Further by using a front-end portion 3 having the function of a modem, output of the front-end portion 3 may be supplied directly to the central processor 115 for predetermined processing therein. If its output is supplied to the video encoder 113, then the receiver is available for connection to the Internet through a public telephone line, for example.

Fig. 1

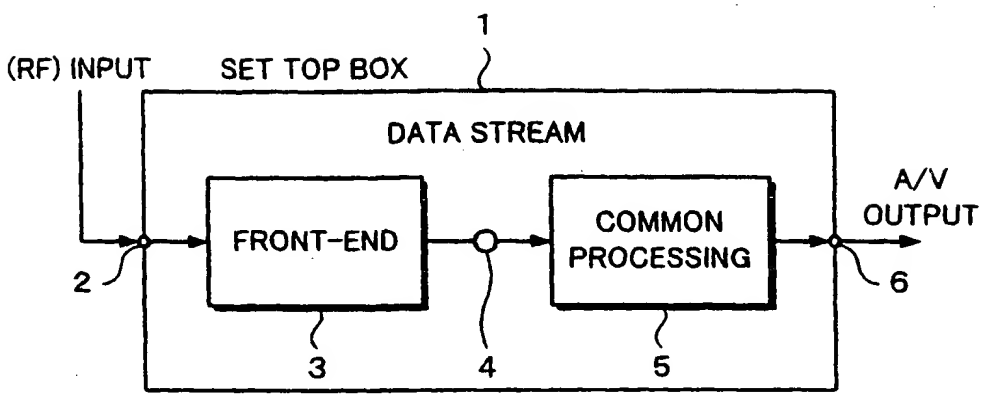


Fig. 2A

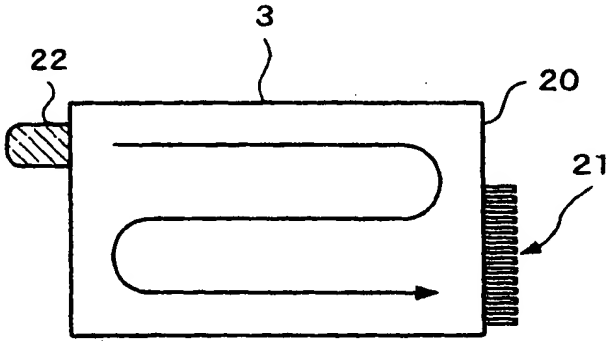


Fig. 2B

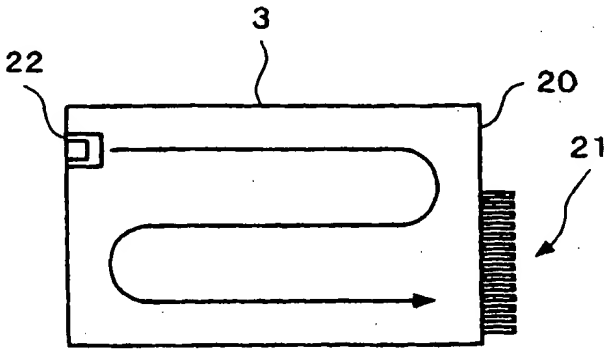


Fig. 4

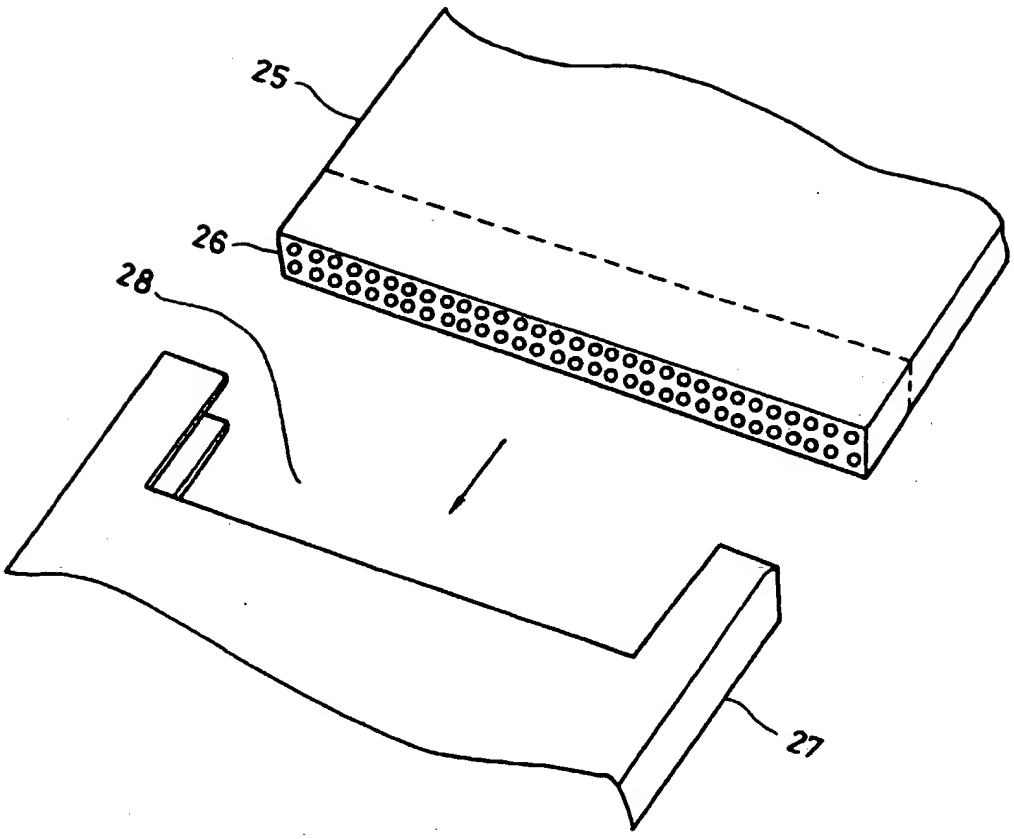


Fig. 6A

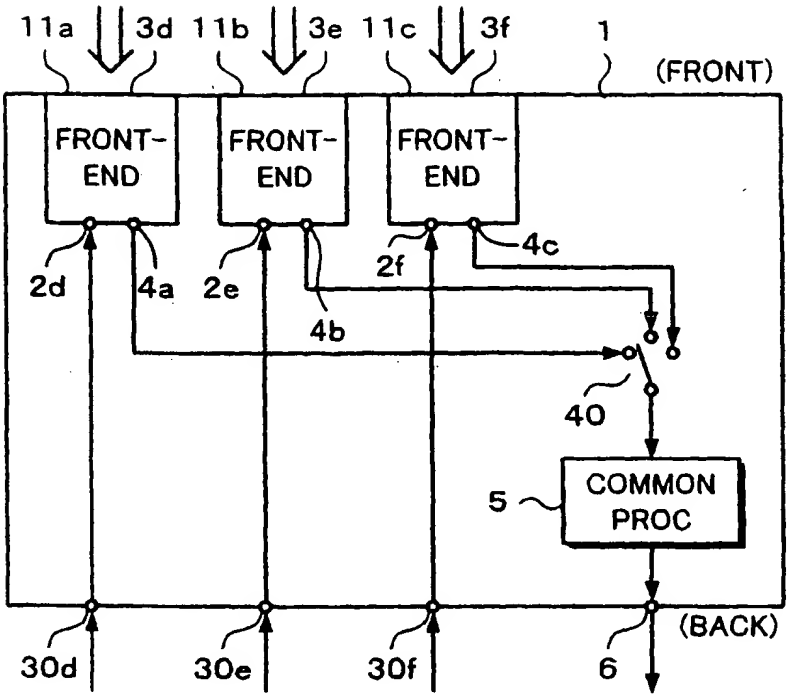
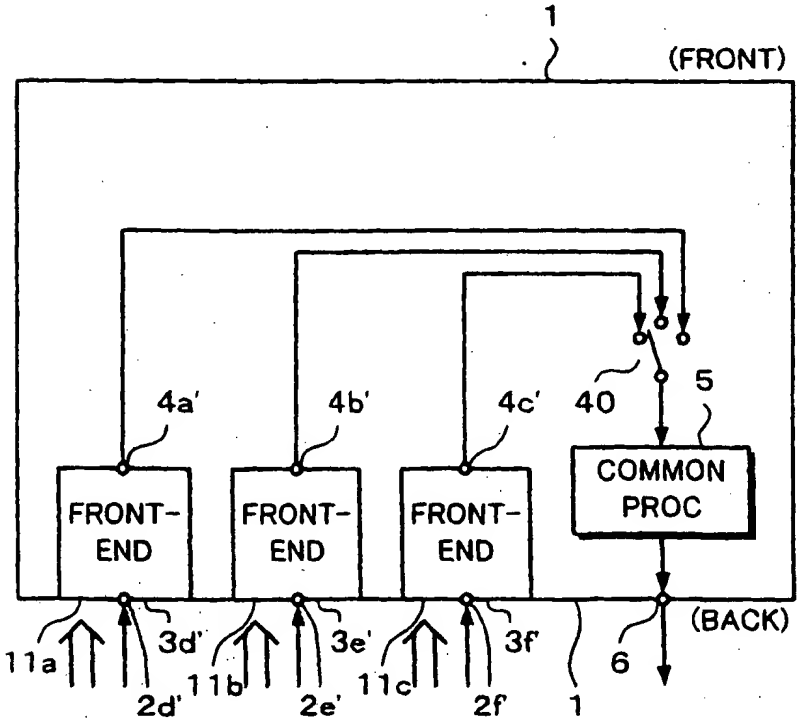

11a
3d
11b
3e
11c
3f
1
(FRONT)
FRONT-END
FRONT-END
FRONT-END
2d
4a
2e
4b
2f
4c
40
5
COMMON PROC
(BACK)
30d
30e
30f
6

Fig. 6B


1
(FRONT)
4a'
4b'
4c'
40
5
COMMON PROC
FRONT-END
FRONT-END
FRONT-END
(BACK)
11a
3d'
2d'
11b
3e'
2e'
11c
3f'
2f'
1
6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP98/05894

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[6] H04N5/46, G06F3/00, G06F13/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[6] H04N5/38-5/46, G06F3/00, G06F13/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1940-1996 Jitsuyo Shinan Toroku Koho 1996-1998
Kokai Jitsuyo Shinan Koho 1971-1996

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP, 06-133245, A (Sony Corp.),	1, 2, 6, 7, 9,
	13 May, 1994 (13. 05. 94) (Family: none)	11
Y		3, 8
A		4, 5, 10
X	JP, 06-189217, A (Toshiba Corp.),	1, 4, 5, 6, 11
Y	8 July, 1994 (08. 07. 94) (Family: none)	8
A		2, 3, 7, 9, 10
X	JP, 09-190404, A (Sony Corp.),	1, 2, 6, 9, 11
A	22 July, 1997 (22. 07. 97) (Family: none)	3-5, 7, 8, 10
X	JP, 61-125290, A (Sony Corp.),	1, 2, 6, 7, 10,
	12 June, 1986 (12. 06. 86) (Family: none)	11
A		3-5, 8, 9
Y	JP, 05-064097, A (Fujitsu Ten Ltd.),	3
	12 March, 1993 (12. 03. 93) (Family: none)	

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
17 March, 1999 (17. 03. 99)	30 March, 1999 (30. 03. 99)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
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